Junior High Math League

Sample Questions by Meet and Topic

Meet 4:

4.1 Sequence and Series
4.2 Simplifying Radical Expressions
4.3 Proportional Scale Models (3-D)
4.4 Modeling with Linear Equations and Graphs
4.5 Parallel and Perpendicular Lines
4.6 Analyzing Scatter Plots

(All sample questions were taken from previous JH Math League meets. Please contact Bill Theisen at btheisen@isd2899.k12.mn.us with any questions regarding the sample questions and answers.)

4.1 Sequence and Series - Questions

1) What is the next term in this sequence: 16, 4, 1, ____

2) What number is next?: −1, 2, 7, 14, ____

3) What number is next?: 24352, 24461, 24570, _____

4) Simplify:

$$\sum_{n=1}^{5} n$$

5) Simplify:

$$\sum_{n=3}^{5} n^3$$

6) The summation has a value of 67.5. What is a?

$$\sum_{n=5}^{a} \frac{n}{2} + 10$$

4.1 Sequence and Series - Answers

1) What is the next term in this sequence: 16, 4, 1, ____

   1/4 or 0.25

2) What number is next?: −1, 2, 7, 14, ____

   23

3) What number is next?: 24352, 24461, 24570, _____

   24679

4) Simplify:

$$\sum_{n=1}^{5} n$$

   15

5) Simplify:

$$\sum_{n=3}^{5} n^3$$

   216

6) The summation has a value of 67.5. What is a?

$$\sum_{n=5}^{a} \frac{n}{2} + 10$$

   $a = 9$

4.2 Simplifying Radical Expressions - Questions

1) Solve for x if:

   $$\sqrt{x} = 3\sqrt{5}$$

2) Simplify:

   $$\sqrt{9800}$$

3) Simplify:

   $$4\sqrt{200}$$

4) Simplify:

   $$\sqrt{1,350}$$

5) Simplify:

   $$\sqrt{90x^4y^3z}$$

6) Solve for x:

   $$32\sqrt{x} = x^3$$

4.2 Simplifying Radical Expressions - Answers

1) Solve for *x* if:

$$\sqrt{x} = 3\sqrt{5}$$

   x = 45

2) Simplify:

$$\sqrt{9800}$$

   Answer: $70\sqrt{2}$

3) Simplify:

$$4\sqrt{200}$$

   Answer: $40\sqrt{2}$

4) Simplify:

$$\sqrt{1,350}$$

   Answer: $15\sqrt{6}$

5) Simplify:

$$\sqrt{90x^4y^3z}$$

   Answer: $3x^2y\sqrt{10yz}$

6) Solve for *x*:

$$32\sqrt{x} = x^3$$

   x = 4

4.3 Proportional Scale Models (3-D) - Questions

1) A remote sensing map shows that 18 square inches of land is submerged in water due to floods. Find the actual area submerged in water, if the scale of the map is 1 square inch : 12 square miles.

2) In an archaeology atlas, it is shown that 25 square inches of land is affected by a tornado. Find the actual area affected, if the scale of the map is 1 square inch : 15 square miles.

3) The pyramids shown are similar. Find the total surface area of pyramid *B*. The ratio of the measures of pyramid *A* to pyramid *B* is 8 : 12.

Pyramid A
$S = 224$ in^2

Pyramid B

8 in.

12 in.
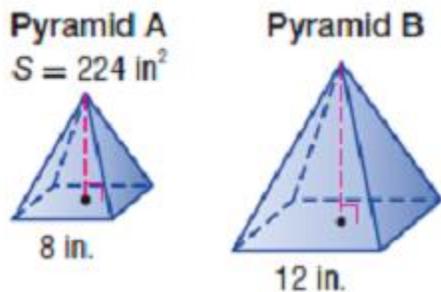
4) The area of Lake Calhoun in Minneapolis is approximately 1.62 square kilometers. A map of the lake has a scale of 1 centimeter : 200 meters. What is the area, in square centimeters, of Lake Calhoun on the map?

5) The volume of a model office building is 90 cubic inches. The scale of the model is 1 inch : 10 feet. What is the actual volume of the office building? Express your answer in scientific notation.

4.3 Proportional Scale Models (3-D) - Answers

1) A remote sensing map shows that 18 square inches of land is submerged in water due to floods. Find the actual area submerged in water, if the scale of the map is 1 square inch : 12 square miles.

   216 square miles

2) In an archaeology atlas, it is shown that 25 square inches of land is affected by a tornado. Find the actual area affected, if the scale of the map is 1 square inch : 15 square miles.

   375 square miles

3) The pyramids shown are similar. Find the total surface area of pyramid *B*. The ratio of the measures of pyramid *A* to pyramid *B* is 8 : 12.

   Pyramid A
   $S = 224$ in^2

   Pyramid B

   8 in.

   12 in.
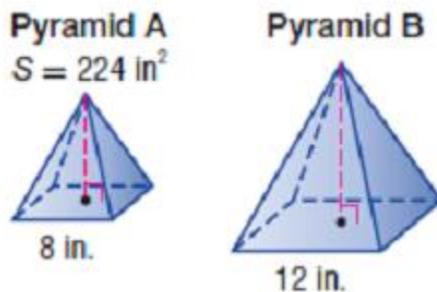
   504 square inches

4) The area of Lake Calhoun in Minneapolis is approximately 1.62 square kilometers. A map of the lake has a scale of 1 centimeter : 200 meters. What is the area, in square centimeters, of Lake Calhoun on the map?

   40.5 cm^2

5) The volume of a model office building is 90 cubic inches. The scale of the model is 1 inch : 10 feet. What is the actual volume of the office building? Express your answer in scientific notation.
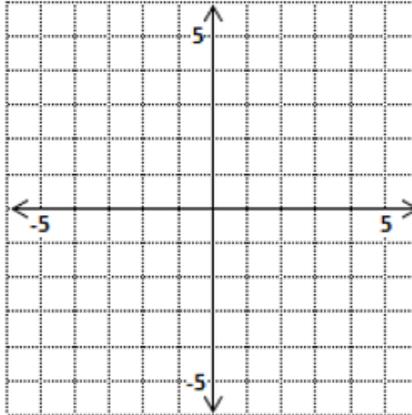
   $9 \cdot 10^4$ ft^3

4.4 Modeling with Linear Equations and Graphs - Questions

1) Graph the lines on the coordinate plane. Then state the ordered pair where the lines intersect.

$y = \dfrac{2}{3}x - 3$

$y = -2x + 5$

2) If two points on a line are (4 , 0) and (0 , 5), what is the equation of the line in slope-intercept form?

3) What is the slope of this line?

$\dfrac{3}{4}x - \dfrac{2}{5}y = 8$

4) If point A is at (−2, 1) and B is at (2, 3), what is the y-intercept of the line containing A and B?

5) What is the slope of this line?

$3x - 4y = 6$

6) What is the y-intercept of this line?

$2\left(x - \dfrac{1}{2}\right) + \dfrac{2}{3}y = 4x$
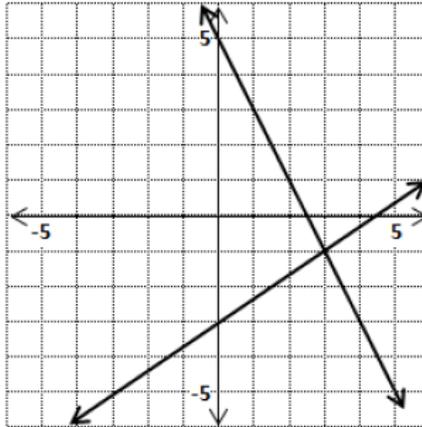
4.4 Modeling with Linear Equations and Graphs - Answers

1) Graph the lines on the coordinate plane. Then state the ordered pair where the lines intersect.

$y = \frac{2}{3}x - 3$

$y = -2x + 5$ **(3, –1)**

2) If two points on a line are (4 , 0) and (0 , 5), what is the equation of the line in slope-intercept form?

Answer: $y = -\frac{5}{4}x + 5$

3) What is the slope of this line?

$\frac{3}{4}x - \frac{2}{5}y = 8$

Answer: $\frac{15}{8}$

4) If point *A* is at (–2, 1) and *B* is at (2, 3), what is the *y*-intercept of the line containing *A* and *B*?

2

5) What is the slope of this line?

$3x - 4y = 6$

Answer: $\frac{3}{4}$

6) What is the y-intercept of this line?

$2\left(x - \frac{1}{2}\right) + \frac{2}{3}y = 4x$
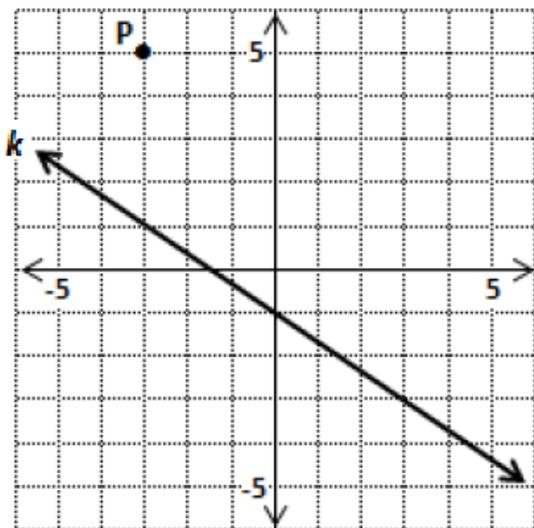
Answer: $\frac{3}{2}$

4.5 Parallel and Perpendicular Lines - Questions

1) What is the equation of the line parallel to $y = \frac{3}{4}x - 2$ that passes through the point (8, 1)?

2) What is the equation of the line perpendicular to $y = \frac{3}{4}x - 2$ that passes through the point (9, 1)?

3) What is the equation of a line through (3, 4) and perpendicular to $y = \frac{1}{3}x - 2$?

4) Line *k* and point *P* are graphed on the coordinate plane. Write the equation of the line parallel to line *k* that intersects point *P*. Express your answer in slope-intercept form (*y=mx+b*).

4.5 Parallel and Perpendicular Lines - Answers

1) What is the equation of the line parallel to $y = \frac{3}{4}x - 2$ that passes through the point (8, 1)?

   **Answer:** $y = \frac{3}{4}x - 5$

2) What is the equation of the line perpendicular to $y = \frac{3}{4}x - 2$ that passes through the point (9, 1)?

   Answer: $y = \frac{4}{3}x + 13$

3) What is the equation of a line through (3, 4) and perpendicular to $y = \frac{1}{3}x - 2$?
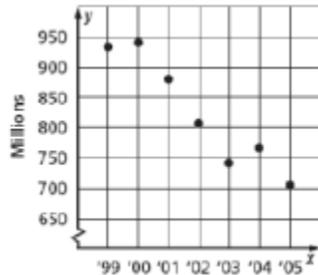
   Answer: $y = -3x + 13$

4) Line *k* and point *P* are graphed on the coordinate plane. Write the equation of the line parallel to line *k* that intersects point *P*. Express your answer in slope-intercept form (*y=mx+b*).
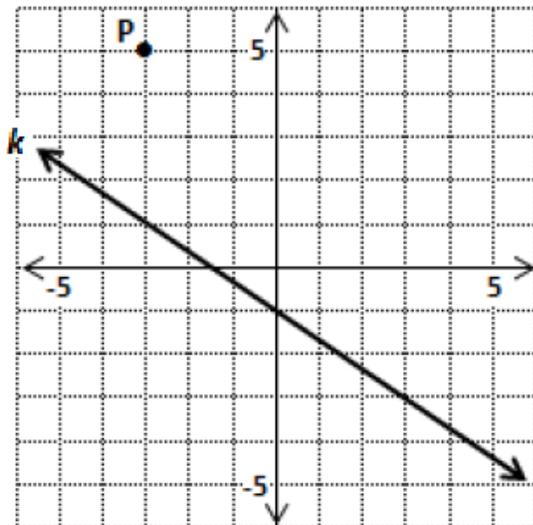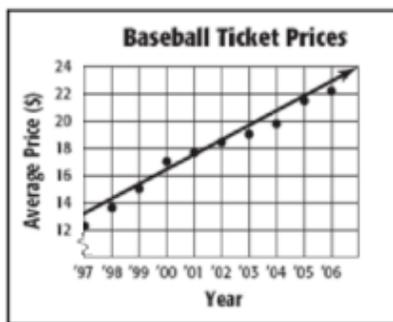

Answer: $y = -\frac{2}{3}x + 3$

4.6 Analyzing Scatter Plots - Questions

1) The scatter plot shows the number of CD's (in millions) that were sold from 1999 to 2005. If the trend continued, about how many CDs were sold in 2006?
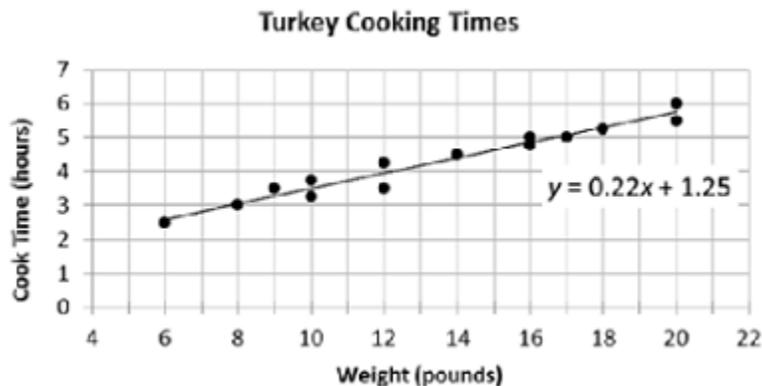

2) The scatter plot shows the average price of a major-league baseball ticket from 1997 to 2006. The values on the *x*-axis represent the years since 1997 (1997 =0, 1998 = 1, etc). Use the points (2001, 17.60) and (2002, 18.75) to write the slope-intercept form of an equation for the line of fit shown in the diagram.

Baseball Ticket Prices

Source: Team Marketing Report, Chicago
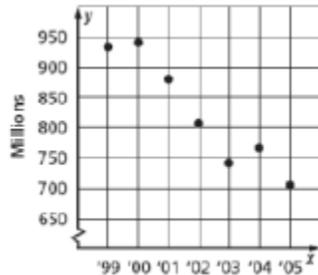
3) What point is not on the line that the others are on?

   (2, 5), (3, 8), (4, 11), (6,17), (8,20)

4) The scatterplot shows some recommended cooking times for turkeys of various weights. A line of best fit and the equation for the line are also shown. Based on this data, what is the estimated cooking time for a 24-pound turkey?
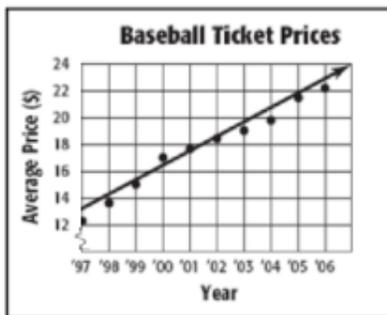
Turkey Cooking Times

$$y = 0.22x + 1.25$$

4.6 Analyzing Scatter Plots - Answers

1) The scatter plot shows the number of CD's (in millions) that were sold from 1999 to 2005. If the trend continued, about how many CDs were sold in 2006?

Between 650 and 700

2) The scatter plot shows the average price of a major-league baseball ticket from 1997 to 2006. The values on the *x*-axis represent the years since 1997 (1997 =0, 1998 = 1, etc). Use the points (2001, 17.60) and (2002, 18.75) to write the slope-intercept form of an equation for the line of fit shown in the diagram.
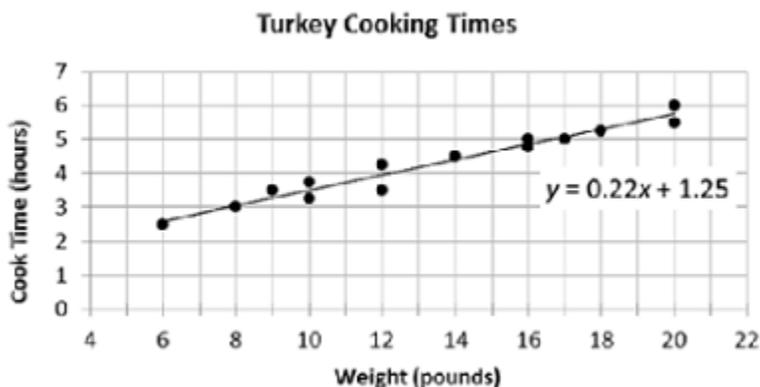

Source: Team Marketing Report, Chicago

Answer: $y = 1.15x + 13$

3) What point is not on the line that the others are on?

(2, 5), (3, 8), (4, 11), (6,17), (8,20)

(8, 20)

4) The scatterplot shows some recommended cooking times for turkeys of various weights. A line of best fit and the equation for the line are also shown. Based on this data, what is the estimated cooking time for a 24-pound turkey?

$y = 0.22x + 1.25$

Approximately 6.5 hours